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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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09/733,392 12/07/00 HAASE

R 0170SS-45347

EXAMINER

IM22/0816

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ART UNIT

PAPER NUMBER

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

09733392-010802

PTO FILE COPY

Office Action Summary	Application No. <u>Control No.:</u>	Applicant(s)	
	<u>09/733,392</u> & <u>94/005710</u>	HAASE, RICHARD ALAN	
	Examiner	Art Unit	
	Chester T. Barry	1724	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION. 37 CFR 1.550(c)

- Extensions of time may be available under the provisions of 37 CFR 1.130(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12/5/01, 4/18/01 (rec'd 3/19/01 & 5/7/01).
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16, 19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16, 19 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 18) ☒ Interview Summary (PTO-413) Paper No(s). _____
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☒ Other: Consideration of Protest Filed 5/31/01 via Fax

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Specification Objections

The specification is objected to under 37 CFR 1.121(b)(1)(iii) for failing to underline textual additions to the patent and for failing to enclosed text deleted from the patent in brackets. For example, a pain-staking and time-consuming word-for-word comparison of the reissue application as filed with the patent Abstract and columns 1

and 2 revealed the following bases for objection under the rule:

In the Abstract, "[ABSTRACT];"
At page 1 line 1,¹ [BACKGROUND OF THE INVENTION];
At page 1 line 5,² "Description of [the] Prior Art;"
At page 1 line 21,³ " ... a final disposal site at a minimal cost;" and
At page 2 line 8,⁴ "polyacrylamide[s].

A cursory comparison of the remainder of the patent revealed the following additional bases for objection:

At page 6 line 5,⁵ "... CHARTS, FOLDERS [TABLES], EXAMPLES ... "
At page 15 line 1,⁶ "IT IS CLAIMED [What is claimed as invention is]:"

Applicant is encouraged to file in the reissue a substitute specification⁷ comprising a soft, cut-up copy of the patent (one patent column per page) including the Abstract on a separate sheet, as has been done by the third party requester in the reexamination. Please ensure that the patent column and line numbers are included on each page of the substitute specification.

Housekeeping

A fax copy of the housekeeping amendment filed on 4/18/01 (as shown by postcard receipt) was received via fax on 5/7/01 and entered. The examiner appreciates applicant's cooperation in facilitating sending a fax copy of the amendment.

¹ Patent col. 1 line 3.

² Patent col. 1 line 8.

³ Patent col. 1 line 36.

⁴ Patent col. 1 line 57.

⁵ Patent col 4, line 21.

⁶ Patent col. 9 line 50.

⁷ 37 CFR 1.125(d) is waived *sua sponte*.

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Reexam Control No. 90/005710
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To date, the hard copy filed 4/18/01 has not been matched with either of the reissue and reexam files.

The patent at issue issued with claims numbered 1 – 16. The amendments to claims 1 and 15 effected by the reexam response filed 2/5/01 have been superceded by the amendments made to *inter alia* claims 1 and 15 in the "housekeeping" amendment of 4/18/01.

Claims 19 and 20

The preliminary amendment filed in the reissue application on 12/7/00, which brought the total number of claims pending to 19, i.e., claims 1 – 19, was first entered, and then the "housekeeping" amendment filed 4/18/01 was entered. Claim 19, added 12/7/01, reads:

19. The method of claim 15 wherein the polyacrylamide is cationic or anionic.

The claim added 4/18/01, identified as new claim "19," reproduced below, has been renumbered as claim "20" under 37 CFR 1.126:

20. 20. The composition of claim 15 wherein the polyacrylamide is cationic or anionic.

Claims 1 – 16 and 19-20 are now pending. It is suggested that claim 19 be cancelled insofar as claim 15 is directed to a composition, not to a method.⁸

⁸ While it appears that applicant's intention was to file "19. (Amended) The composition of claim 15 wherein the polyacrylamide is cationic or anionic." "new" claim 20 is nevertheless of record. Please note claim 20.

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In view of the extant discrepancies between the specification of the reexamination and the specification of the reissue application, as noted above at the section, "Specification Objections," beginning at page 2), it is clear the housekeeping amendment dated 4/18/01 did not effect "identical amendments" in the reissue and reexam as required by the Decision to Merge (reissue paper 10, reexam paper 10, Mar. 21 2001, page 4, section II). The housekeeping amendment appears to have been a *bona fide* attempt to comply with the requirement noted in the Decision.

The housekeeping amendment effected substantially identical copies of the claims in each of the reissue and reexam files. The only discrepancies found between the two files were in claim 5: Claim 5 of the reexam is in proper form. Claim 5 of the reissue states, *inter alia*, "... wherein the ploymeric [sic, "polymeric"] quaternary ammonium compound and the cationic polyacrylamide are in an approximately 1:1 ratio. [sic, ","] with the ...". These two obviously merely typographical errors in claim 5 of the reissue application have been corrected by informal examiner's amendment. No further action is required by applicant in this regard.

Information Disclosed Not Considered

The information submitted on 12/5/00, i.e., the Murthy "Water Environment Research" article, the Novak article ("Changes ...," source and date unspecified), and Murthy ("Biosolids ...," source and date unspecified) have not been considered for want

of compliance with either 37 CFR 1.97(c)(1) or 37 CFR 1.97(c)(2), 37 CFR 1.98(a)(1), and the last sentence of 37 CFR 1.98(b).

Recapture Analysis

Broadening

Claim 1 (amended) is broader than patent claim 1 as issued with respect to the following aspects of the claimed invention: The ***number*** of polymeric quaternary compounds added: Claim 1 (amended) reads on a method in which as few as one such compound is added. In contrast, patent claim 1 required the addition of at least two compounds ("compounds," plural). Similarly, a corresponding change is also made in composition claim 15. That is, claim 15 (amended) reads on a composition having as few as one polymeric quaternary ammonium compound. In contrast, patent claim 1 required the presence in the composition of at least two such compounds. The other textual changes to claim 15 (amended) do not effect broadening.

To the extent that applicant may have argued that the numerous recitations of "polymeric quaternary ammonium compound" (singular in number) in many of the claims dependent on claim 1⁹ should be construed as evidence that claim 1 as issued covered use of as few as one polymeric quaternary ammonium compound, the argument appears to have been waived by applicant's explicit statement in the reissue declaration that, "[t]his [application] may be considered a broadening reissue."

To the extent that applicant may have argued that claim 1, construed in view of the prosecution history of the patent, was given fair notice that claim 1 in fact covered the use of as few as a single polymeric quaternary ammonium compound,¹⁰ this argument appears to have been waived by applicant's explicit statement in the reissue declaration that, "[t]his [application] may be considered a broadening reissue."

Surrender

During prosecution of the patent, no rejections were made. No reasons for allowance were made of record. Consequently, the prosecution history does not indicate subject matter covering use of as few as one polymeric quaternary ammonium compound, or compositions comprising as few as one polymeric quaternary ammonium compound, was surrendered.

Accordingly, no recapture is found. Broadening of claims with respect to the number of polymeric quaternary ammonium compounds aspect of the claims is not precluded.

⁹ For example, recitation of "... wherein the polymeric quaternary ammonium **compound is** ..." (emphasis added) in patent claims 4, 8, and 9, and of "the polymeric quaternary ammonium **compound**" (emphasis added) in claims 5, 6, 10 and 12.

¹⁰ In applicant's "Response to First Office Action Summary Election/Restriction" filed 10/28/97 (paper 4 of Ser. No. 08/721557, now U.S. Pat. No. 5846435), applicant referred to the "polymeric quaternary ammonium compound" of claim 1 part 1a. Applicant told the examiner that

Claims 1 to 16 ... protect the first and second biological sludge dewatering methods ... In both the first and second method, polyquaternary amine (i.e. polymeric quaternary ammonium **compound** - refer to claim 1a) **is added** to the biological sludge ...

(emphasis added). In response to the election including these remarks, claims 1 - 16 were allowed by the examiner.

Claim Objections

Claims 2 and 3 are objected to because of the following grammatical informality:

It is not clear how a compound can be "from ... family." Appropriate correction is required. Per claim 2, the following amendment is suggested to overcome this objection: "... wherein the polymeric quaternary ammonium compound[s are from] is a di-allyl di-methyl ammonium chloride (DADMAC) [family] compound" or "... wherein the polymeric quaternary ammonium compound[s are] is from the di-allyl di-methyl ammonium chloride (DADMAC) family." Per claim 3, the following amendment is suggested to overcome this objection: "... wherein the polymeric quaternary ammonium compound[s are from] is an epichlorohydrin di-methyl amine (epi-DMA) [family] compound" or "... wherein the polymeric quaternary ammonium compound[s are] is from the epichlorohydrin di-methyl amine (epi-DMA) family."

Claim 16 is objected to because of the following grammatical informality: The verb "is" fails to agree in number with the plurality defined by "the polyacrylamide" and the "polymeric quaternary ammonium compound." Furthermore, it is not clear if the scope of "at least one polymeric quaternary ammonium compound" as recited in claim 1 is being limited in claim 16 to not more than one such compound insofar as the expression "at least one" is not recited in claim 16. Appropriate correction is required. The following amendment is suggested to overcome this objection:

16. (twice amended) . . . wherein the polyacrylamide and [the] said at least one polymeric quaternary ammonium compound[s] are used in . . .

Claim 4 is objected to because of the following grammatical informality: The verb "is" fails to agree in number with the plurality defined by "the polyacrylamide" and the "polymeric quaternary ammonium compound." It is not clear if the scope of "at least one polymeric quaternary ammonium compound" as recited in claim 1 is being limited in claim 4 to not more than one such compound insofar as the expression "at least one" is not recited in claim 4. Appropriate correction is required. The following amendment is suggested to overcome this objection:

4. (amended) . . . wherein [the] said at least one polymeric quaternary ammonium compound is added directly to the sludge and, upon formation of microflocs of the sludge from [the] said at least one polymeric ammonium compound . . .

In claims 7 and 13, "wherein polymer concentration to solids ratio" should be amended to "wherein the polymer concentration to solids ratio" to ease understanding. In claim 10, recitation of "does" is objected to for grammatical reasons. Please delete "does."

35 U.S.C. 112, second paragraph

Claims 2-16, 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

"the polymeric quaternary ammonium compound" / "the polyacrylamide"

In claims 2 – 16, in each instance of recitation of "the polymeric quaternary ammonium compound" or "the polyacrylamide," it is unclear if the "at least one polymeric quaternary ammonium compound" or the "at least one polyacrylamide,"

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respectively, is being limited to not more than **one** such polymeric quaternary ammonium compound or not more than **one** such polyacrylamide in the dependent claims.

Per claim 4, it is unclear whether the "cationic polyacrylamide" recited in claim 4 is the very same "polyacrylamide" recited in claim 1. The following amendment would overcome this rejection:

4. (amended) . . . compound, wherein said at least one polyacrylamide is a cationic polyacrylamide and is added to . . .

Similarly, per claim 8, it is unclear whether the "anionic polyacrylamide" recited in claim 8 is the same "polyacrylamide" recited in claim 1.

"any quantity . . . that is added to claim 4"

Per claim 9, "any quantity . . . that is added to claim 4" cannot be understood. First, quantities of compounds cannot be added "to" claims. Claims define the metes and bounds of an invention. Secondly, claim 4 does not recite any quantity of polymeric quaternary ammonium compounds. Finally, since none of the limitations in either claim 4 or claim 1 (the claim upon which claim 4 depends) precludes the addition of **excess** polymeric quaternary ammonium compound, i.e., more than the minimum necessary to effect some degree of sludge dewatering, the quantity of this compound which **could** be added in a process within the scope of claim 4 is unbounded. Accordingly, a quantity that is 20 – 30% higher than an unbounded quantity is also unbounded, ill-defined, unknowable, and indefinite. By analogy, 130% of "infinity" is itself "infinity."

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"ratios"

Per claims 6 and 12, it is unclear whether "ratios" refers to the ratio of the quantity of each of the at least **two** polymeric quaternary ammonium compounds to the quantity of anionic polyacrylamide. Alternatively, it is unclear whether "ratios" should be replaced by "ratio" of the total quantity of polymeric quaternary ammonium compounds to the total amount of anionic polyacrylamide. Appropriate correction is required.

"as a functionally primary component"

The meaning of "as a functionally primary component," specifically, any distinction in meaning between "as a functionally primary component" on the one hand and simply "as a primary component" on the other, cannot be ascertained from the original disclosure and the prior art or record, with a reasonable degree of precision. Applicant's remarks at pages 2 – 3 of the Response filed 2/5/01 (received in OIPE 3/19/01) in the Reexam (prior to merger), however, together with the prior art discussed below, clarify without insertion of the word "functionally" that the skilled artisan would have understood with a reasonable degree of precision the meaning of "as a primary component."

In the reexam Amendment filed 2/5/01,¹¹ applicant argues "primary component" does not mean "added first in time," as suggested by the examiner in the reexam Office action of 12/4/00. Rather, "primary component" means the component "first in order of development."

¹¹ Dated 2/5/01 and bearing a certificate of mailing date of deposit of "2/5/00 [sic, 2/5/01]", a copy of which was received by the Petitions Office via fax on 3/15/01.

Applicant's interpretation of "primary component," namely, that the polymeric quaternary ammonium compound acts to create microflocs which are necessarily thereafter "amalgamated" into larger flocs by the polyacrylamide, is consistent with the specification and the prior art, as exemplified by:

U.S. Pat. No. 4456534 to Lambert at col. 1 states, "Polymeric flocculants in general cause the suspended colloidal particles in waste water to aggregate thereby facilitating their separation from the water. In many cases, it has been found to be advantageous to first add an inorganic salt such as alum or calcium chloride as a **primary coagulant** in order to sensitize the suspended particles to flocculation" (emphasis added);

U.S. Pat. No. 4670158 to Kelly suggests that the art contemplates precipitation and coagulation as two separate and distinct functional steps, to wit, "[a] process for treating waste water which contains an undesirable level of suspended organic materials comprising a precipitation and coagulation by the controlled addition of lime and phosphoric acid" and "[a] representative process of the prior art comprises the precipitating and coagulating of the solids therein by chemical means and subjecting the wastewater to a step of dissolved air flotation so as to float the sludge formed of coagulated particulates to the surface" (at column 1);

U.S. Pat. No. 5047511 to Mehrotra, discussing particular flocculants "either as primary flocculants, or in conjunction with a high molecular weight nonionic or anionic polyelectrolyte" at col 6 line 23;

U.S. Pat. No. 5681475 to Lamensdorf's employment of the terms "primary colloidal flocculant" and "secondary colloidal flocculant" (col 2); and

U.S. Pat. No. 5614616 to Buysch describing "primary flocculating agents" as "chemical compounds which form substantially water-insoluble precipitates" (col 4 line 54)

More to the point, the examiner's construction of "as primary component" beginning at page 4 of the reexam Office action (mailed 12/4/00) as being limited to the "first added" component is unreasonable. There does not appear to be any basis in the prior art for this admittedly strained construction. The examiner suggests, however, that the word

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"functionally" be deleted from the phrase "as functionally primary component" because it only begs the question of whether, and in what respect, "as functionally primary component" differs in meaning from simply, "as primary component" as the later would have been understood by the skilled artisan. The prior art noted above shows that skilled artisans reading applicants disclosure would have understood "as primary component" to mean the "microfloc-creating component" (or suspended solids-precipitating component) rather than the microfloc enlarging, coagulating, agglomerating, and/or amalgamating component.

Claim 19

Claim 19 recites the "method" of claim 15. On it's face, this recitation renders claim 19 unpatentable under §112, second parag., because claim 15 is directed to a composition rather than to a method. On the other hand, claim 15 does indeed "recite" a method, but that method is the method of claim 1, not the method of claim 15. To the extent that applicant's intention in claim 19 is to invoke the method of claim 1 "imbedded" in claim 15, amending claim 19 to depend from claim 1 directly is the least cost mechanism by which the claim 19 scope may be clarified.

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Obviousness Type Double Patenting

U.S. Pat. No. 5,906,750 to Haase

Claims 1 – 14, 16 are rejected under the judicially created doctrine of double patenting¹² over claim 1 of U. S. Patent No. 5,906,750 issued to Haase, the patent owner of the patent under reexamination. The claims, if confirmed, would improperly extend¹³ the "right to exclude" already granted in the '750 patent. Rejection under this doctrine is appropriate because claim 1 of the '435 patent under reexamination "covers" or encompasses any method that would infringe claim 1 of the '750 patent.

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¹² The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

¹³ The examiner is mindful that the expiration date of the '750 patent (absent any patent term extensions which may be or have been granted) is the same as that of the '435 patent, namely, twenty years after the actual or earliest filing date for which the benefit under 35 U.S.C. §120 is claimed, i.e., Sept. 26, 1996. Hence, by "extend," the examiner means the possible extension of patent enforcement rights to an entity other than the owner and/or exclusive licensee of the '750 patent through assignment or exclusive licensing.

For comparison, the two claims are presented side-by-side below (differences in language boldfaced):

Claim 1 of '435 Patent under re/examination	Claim 1 of '750 Patent
<p>1. A method for dewatering biological sludge that has been digested by a thermophilic digestion process comprising:</p> <p>a. adding at least one polymeric quaternary ammonium compound,</p> <p>as a functionally primary component, to the biological sludge;</p> <p>b. adding at least one polyacrylamide to the biological sludge;</p> <p>c. coagulating the biological sludge to form microflocs whereby said at least one polymeric quaternary ammonium compound functions as a primary component in forming microflocs; and</p> <p>d. flocculating the microflocs with said at least one polyacrylamide</p> <p>such that the combination of the polymeric quaternary ammonium compound and of the polyacrylamide enhances dewatering of the sludge.</p>	<p>1. A method for dewatering biological sludge that has been digested by a thermophilic digestion process comprising:</p> <p>a. adding polymeric quaternary ammonium compounds,</p> <p>aluminum sulfate, ferric chloride and blends thereof,</p> <p>as primary component, to the biological sludge; and</p> <p>b. adding polyacrylamide to the biological sludge;</p> <p>such that any combinations of the primary component and of the polyacrylamides enhance dewatering of the sludge.</p>

As indicated above, any infringement of claim 1 of the '750 patent would necessarily also infringe claim 1 of the '435 patent under reissue / reexamination. Specifically, the addition of polymeric quaternary ammonium compounds, and aluminum sulfate, and ferric chloride, and blends of polymeric quaternary ammonium compounds, aluminum sulfate, and ferric chloride, as required by claim 1 of the '750 patent and therefore any infringing method, would meet the '435 patent claim 1 limitation of "adding at least one polymeric quaternary ammonium compound." Further, addition of the "primary

component” quaternary compounds necessarily requires that microflocs are created, as discussed at the sub-section, “as a functionally primary component”, at page 11.

Accordingly, confirmation or allowance of claim 1 of the '435 patent could result in exposure of an unlicensed party using the method of claim 1 of the '750 patent to suit from both the owner or exclusive licensee of the '750 patent as well as that of the '435 patent.

35 U.S.C. 103(a) – Ort, Allied Colloid, and Kurita

Claims 1 – 2, 4 -10, 12 – 14, 16, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ort, Allied Colloid, and Kurita.

Ort

U.S. Pat. No. 4040953 to Ort describes a thermophilic digestion process operated at about 60°C (col 4 line 17). The excess sludge from the thermophilic digestion process ("residue slurry" of Fig. 1) is thickened and dewatered by undisclosed means. As clearly shown by the return of recycle water to the wet pulping step and discharge of the solids residue cake, the purpose of the thickening and dewatering step is to separate water from the solid phase wasted thermophilic biological sludge. Ort fails to anticipate claim 1 at least for want of description of the combination of a polymeric quaternary ammonium compound and polyacrylamide.

Allied Colloid

WO93/02968 to ALLIED COLLOIDS is cited for solid/liquid separation of a biological sludge.¹⁴ The reference is directed to processes and compositions for separating suspended solids from an aqueous suspension, e.g., sewage. Following "biological treatment" of a clarified liquor to convert soluble and colloidal materials to biomass, the biomass is separated from the liquor in a secondary sedimentation step (page 4 lines 10-20). During the secondary sedimentation step, a cationic polymer is added followed by an anionic colloidal material (page 4 line 4). The cationic polymer can be DADMAC (page 5 line 7). The cationic polymer added to the suspension should have a sufficiently low molecular weight such that "the flocculation process can more properly be described as coagulation" (page 5 line 14). DADMAC polymers are especially preferred (page 6 line 3). They may be used in liquid or solid ("beads") form (page 6 line 9). The reference describes, inter alia, including a relatively low molecular weight cationic polymer as a coagulant, e.g., DADMAC (p.10 l. 18-19), followed by a higher molecular weight cationic polymer, e.g., acrylamide polymer with 3 – 25 mol.% cationic monomer (p. 6 lines 34-36), or an anionic polymer copolymerised with acrylamide (p.7 lines 1-4), to act as a bridging flocculant (p.6 lines 12-17). The reference speaks of the "initial" flocs that are microflocs" (p.8 line 4). Note Example 1 runs 1, 2, 4; Example 2 runs 1 – 4, and Example 3 runs 1-3.

Applicant's specification makes clear that "[d]igestion is a biological process during which the bacteria from the treatment system are consumed by other bacteria or

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by each other" (col 1 line 53). Furthermore, Applicant's specification makes clear that a "thermophilic digestion system relies on high operating temperatures[, i.e.,] greater than about 55°C or 131°F."

WO93/02968 to ALLIED COLLOIDS fails to anticipate claim 1 only because it fails to describe the influent "sewage" or the sediment from the first sedimentation stage to which the DADMAC and anionic or cationic polyacrylamide is added as micro-organisms consumed by other bacteria or by each other at a temperature greater than about 55°C or 131°F.

Kurita

Not unlike the ALLIED COLLOIDS process, JP 51-33867 (see also Derwent Accession No. 1976-78708X) to KURITA describes a method of dewatering sludge in the presence of a combination of low molecular weight polyalkylene polyamines and a high molecular weight polyacrylamide or modified polyacrylamide. The KURITA reference teaches one to expect improved coagulation, increased filtering speed, improved quality of treated water, and high combustion (i.e., biodegradation) efficiency from use of such a "combination" of high and low molecular weight polymeric coagulants. Of special relevance to the case at hand, the reference suggests using this approach for the treatment of "excess sludge," i.e., what the skilled artisan would

¹⁴ U.S. Pat. No. 4731182 to High is cited for teaching that a "waste activated sludge" is a "biological sludge consisting essentially of micro-organisms . . . relatively free of solid lumps."

understand to be "wasted sludge,"¹⁵ and "digested sludge" generated in waste water treatment plants.

Conclusion of Obviousness

It would have been obvious to have employed the ALLIED COLLOIDS process for separating biological solids from water in the thickening and/or dewatering steps of Ort because before the invention was made, KURITA gave the skilled artisan a reasonable expectation of success, namely, improved coagulation, increased filtering speed, improved quality of treated water, and high combustion (i.e., biodegradation) efficiency, of dewatering a "digested sludge," such as the thermophilic digested sludge of Ort, if – as suggested by KURITA - a combination of a low molecular weight polyalkylene polyamine and a high molecular weight polyacrylamide or modified polyacrylamide were used.

With respect to the ratio of the polymeric quaternary ammonium compound and the polyacrylamide, the relative proportion of any combination of principal ingredients in a formulation is a known result-effective variable. Hence, any modification of the ratios taught by Allied Colloid to meet the limitations of any of claims 5 – 6 would have been obvious. Furthermore, the total amount of polymer added, relative to the "load" of suspended solids to be separated, is also a recognized result-effective variable. Therefore, any modification of the amount of polymer added per unit solids taught by Allied Colloid to meet the limitations of claim 7 would also have been obvious. Page 9 of Allied Colloids states that polymer concentration based on total suspension, polymer

¹⁵ Note applicant's description of "'wasted' [bacteria] from the activated sludge system" (at col 1 line 51).

concentration based on total solids, and solids concentration based on total suspension are all known result effective variables. At the specific polymer concentrations of conditions of 1, 2, 5, 10, 50, 100, and 500 ppm polymer based on total suspension, and the specific disclosed solids concentrations of 2000 and 8000 ppm solids, the ALLIED COLLOID reference specifically discloses polymer (ppm) : solids (unit %) dosage ratios of 1.25, 2.5, 5, 6.25, 10, 12.5, 25, 50, 62.5, 125, 250, 500, 625, and 2500 ppm polymer per unit percent solids, thereby meeting the claim 7 limitation range endpoint of 50 ppm : solids % and the "about 300" range endpoint as well.

Per claim 14, as explained above, it would have been obvious to have employed the ALLIED COLLOID process in the thickening step of Ort. Accordingly, in the modified process, "biological sludge" leaving the digester via the biological solids recovery step would be mixed with precipitated microflocs, i.e., "primary sludge."

35 U.S.C. 103(a) – Ort, Allied Colloid, Kurita, and admitted prior art

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ort, Allied Colloid, and Kurita, as applied to claim 1 above, further in view of the admitted prior art.

Applicant states at column 5 lines 4-10 that:

Di-allyl di-methyl ammonium chlorides (DADMAC) and epichlorohydrin di-methyl amine (epi-DMA) are two preferred polyquaternary amines used in sludge dewatering. Both of these polyquaternary amine moieties have been found to provide sites for the dewatering of sludge from the thermophilic digestion process.

The first of these two sentences appears to describe the prior art because it is directed to "sludge dewatering" generally rather than to dewatering of sludge from a thermophilic digestion process. In contrast, the second of the two sentences relates to applicant's discovery that either compound could be used in his invention relating to dewatering a thermophilic digestion sludge. It would have been obvious to have substituted epi-DMA for the DADMAC of Allied Colloid in view of the admission that the art recognizes both compounds as polyquaternary amines, Allied Colloid teaches use of DADMAC, a polyquaternary amine, and because – like DADMAC – epi-DMA is "preferred" in the art for dewatering biological sludges generally.

35 U.S.C. 102(b) – Allied Colloid, McGrow, or Chung

Claims 15, 20¹⁶ are rejected under 35 U.S.C. 102(b) as being anticipated by ALLIED COLLOID, McGrow, or Chung. The discussion of ALLIED COLLOID above is incorporated herein. The discussion of McGrow and Chung from the previous reexam Office action (reexam paper 8, mailed 12/4/00, at pages 12-13) is incorporated herein:

McGrow

McGrow describes the addition of mixtures of a polymeric coagulant and a polymeric flocculent in a variety of physical forms to a sewage sludge. For example, the reference teaches that aqueous solutions of a low molecular weights coagulant to a suspension was known (col 2 line 2). The reference teaches also that addition of a powder or dispersion of high molecular weight flocculent to a suspension was known (col 2 line 5). McGrow describes simultaneously providing both "the" coagulant polymer, e.g., (meth)acrylamide (col 4 line 2), a co-polymer from DADMAC/dimethylaminopropyl methacrylamide salt (col 4 line 22) or a polymer of DADMAC (col 4 line 37), and "the" flocculent polymer to the suspension in solution form (col 3 lines 6, 20-27), e.g., a polymer of (meth)acrylamide (col 4 line 58). The particulate composition, e.g., emulsion

¹⁶ Please review the discussion of claims 19 and 20 at sub-section, "Claims 19 and 20," on page 4.

(col 4 line 63), dispersion (col 4 line 64) or dry particulate solid (col 5 line 4), can contain "both polymers" (col 4 line 63). A preferred form is a blend, i.e., a physical mixture, of polymeric DADMAC homopolymer or copolymer with up to 30% acrylamide-based co-polymer (col 5 lines 48-55). The ratio of coagulant polymer : flocculent polymer is between 0.1 :1 – 10 :1 (col 5 lines 57-63). "Drier cakes" are described (col 6 line 43). Dosing of both polymers to the suspension is preferably done simultaneously (col 7 line 1). See col 7 lines 37-64.

While the reference describes "both" types of polymers (col 5 line 65), the reference fails, however, to describe addition of at least two polymeric quaternary ammonium compounds to a suspension, as required by each of claims 1 – 14, 16. Similarly, while McGrow describes addition of mixtures of a polyacrylamide compound in a variety of physical forms to a sewage sludge, the reference fails to describe addition of at least two polyacrylamide compounds to a suspension, again, as required by each of claims 1 – 14, 16. Accordingly, McGrow does not anticipate any of claims 1 – 16.

Moreover, the suspension to which the polymeric coagulant and flocculent is added is not a biological sludge resulting from a thermophilic digestion process, as required by each of claims 1 – 14, 16. Accordingly, for this reason as well, McGrow does not anticipate claims 1 – 14, 16.

Chung

Chung also describes a mixture of an effective dewatering amount of a coagulant and an effective dewatering amount of a flocculent, but in each case a single coagulant or flocculent is selected from a group consisting of individual polymers (col 2 line 62 – col 3 line 11) – it is never suggested by Chung that coagulant or flocculent could or should be a combination of at least two of the compounds listed in group A (col 2 line 62) or group B (col 3 line 7). It is noted that the Markush groups listed at col 2 line 65 – col 3 line 10 (and Chung claim 1) do not include "or combinations thereof." As noted above, claim 1 of the '435 patent requires that the combinations be of at least two polymeric quaternary ammonium compounds (plural) and at least two polyacrylamides (plural). None of the examples at Chung Table 1 describes or suggests pending claim 1 because each polymer A – J of the polymer pairings listed in the table, e.g., from "F/A" to "J/A," is itself an individual co-polymer and not a mixture of at least two polymers.

Any one of these three references describes the claimed composition. As noted previously, the intended use of the composition does not limit the claimed composition.

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Indication of Allowable Subject Matter

Per claim 11, ALLIED COLLOID teaches use of a polyacrylamide having 3 – 25 mol.% anionic monomer. It is not immediately apparent to what extent “mol.% anionic monomer” corresponds to “anionic charge density,” the latter being the meaning applicant attributes to “40% anionic” (see patent column 6 line 39). U.S. Pat. No. 5435949 to Hoots (col. 23), however, together with applicant’s use of percentage units, supports the factual assertion that “anionic charge density” and “mole percent anionic monomer” correspond as synonymous terms for the same property. Accordingly, only impermissible hindsight could justify the conclusion that claim 11, reciting an anionic charge density of 40%, is obvious in view of ALLIED COLLOID’s teaching of 3 – 25 mol.% anionic monomer. Claim 11, therefore, is not rejected under §103 over the combination of Ort, Allied Colloid, and Kurita.

Claim 11 would be indicated as allowable upon presentation of claim 11 in independent form, amended to overcome all applicable §112 rejections, and after a terminal disclaimer is accepted.

Art Cited of Interest

GB1188394 to FOSECO INTERNATIONAL is cited of interest for describing the synergistic benefit effected through use of an inorganic low molecular weight coagulating agent and a polyacrylamide in combination (page 1 lines 67-74; claim 2). EP 0386817 p.2 line 27 is cited for disclosure of exocellular polysaccharide-forming thermophilic bacteria. U.S. Pat. No. 5954964 to Nielsen and Holbrook is cited of interest (col. 8 line 53).

Response to Arguments

Applicant's arguments with respect to the "primary component" construction issue were by-and-large persuasive. But see the §112, second paragraph, rejection of "as a functionally primary component" above.

FINAL ACTION

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Specifically, broadening of the claims to read on *inter alia* use of the combination of a polymeric quaternary ammonium "compound" (singular) and polyacrylamide necessitated the new grounds of rejection. ~~Accordingly, THIS ACTION~~
~~IS MADE FINAL. See MPEP § 706.07(a).~~

A shortened statutory period for response to this action is set to expire 2 months from the mailing date of this action. See the Decision to Merge (page 4).

Extensions of time under 37 CFR 1.136(a) do not apply in MERGED reexamination / reissue proceedings. The provisions of 37 CFR 1.136 do not apply to parties in a reexamination proceeding. Further, in 35 U.S.C. 305 and in 37 CFR 1.550(a), it is required that reexamination proceedings "will be conducted with special dispatch within the Office."

Extensions of time in reexamination proceedings are provided for in 37 CFR 1.550(c). A request for extension of time must be filed on or before the day on which a response to this action is due. The mere filing of a request will not effect any

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extension of time. An extension of time will be granted only for sufficient cause, and for a reasonable time specified.

^a
The filing of a timely first response to ~~this~~ final rejection will be construed as including a request to extend the shortened statutory period for an additional month, which will be granted even if previous extensions have been granted. In no event, however, will the statutory period for response expire later than SIX MONTHS from the mailing date of ^a ~~the~~ final action. See MPEP § 2265.

Respectfully,

United States Patent & Trademark Office

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Appendix – Claims

(sans underlining and bracketing).

1. A method for dewatering biological sludge that has been digested by a thermophilic digestion process comprising:
 - a. adding at least one polymeric quaternary ammonium compound, as a functionally primary component, to the biological sludge;
 - b. adding at least one polyacrylamide to the biological sludge;
 - c. coagulating the biological sludge to form microflocs whereby said at least one polymeric quaternary ammonium compound functions as a primary component in forming microflocs; and
 - d. flocculating the microflocs with said at least one polyacrylamide such that the combination of the polymeric quaternary ammonium compound and of the polyacrylamide enhances dewatering of the sludge.
2. The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compound is from di-allyl di-methyl ammonium chloride (DADMAC) family.
3. The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compound is from epichlorohydrin di-methyl amine (epi-DMA) family.
4. The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compound is added directly to the sludge and, upon formation of microflocs of the sludge from the polymeric quaternary ammonium compound, a cationic polyacrylamide is added to form a floc that dewateres the sludge.
5. The method for dewatering biological sludge according to claim 4, wherein the polymeric quaternary ammonium compound and the cationic polyacrylamide are in an approximately 1:1 ratio, with the cationic polyacrylamide having a higher molecular weight than the polymeric quaternary ammonium compound does.
6. The method for dewatering biological sludge according to claim 4, wherein ratios of the polymeric quaternary ammonium compound with respect to the cationic

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polyacrylamide range from about 1:10 to about 20:1.

7. The method for dewatering biological sludge according to claim 4, wherein polymer concentration to solids ratio of total polymer dosage requirement in relationship to percentage of solids component of the sludge is between about 50 ppm:1 percent and about 300 ppm:1 percent.
8. The method for dewatering biological sludge according to claim 1, wherein the polymeric quaternary ammonium compound is added directly to the sludge, in an amount sufficient to cause formation of a cationic overcharge within a developed microfloc system, and an anionic polyacrylamide is then added for final floc formation.
9. The method for dewatering biological sludge according to claim 8, wherein the polymeric quaternary ammonium compound is added to the sludge in a quantity that is approximately 20 to approximately 30 percent higher than any quantity of the polymeric quaternary ammonium compound that is added in claim 4.
10. The method for dewatering biological sludge according to claim 8, wherein the polymeric quaternary ammonium compound and the anionic polyacrylamide are in an approximately 10:1 ratio, with the anionic polyacrylamide having a higher molecular weight than the polymeric quaternary ammonium compound does.
11. The method for dewatering biological sludge according to claim 10, wherein the anionic polyacrylamide is about 40% anionic.
12. The method for dewatering biological sludge according to claim 8, wherein ratios of the polymeric quaternary ammonium compound to the anionic polyacrylamide range from about 1:10 to about 20:1.
13. The method for dewatering biological sludge according to claim 8, wherein polymer concentration to solids ratio of total polymer dosage requirement in relationship to percentage of solids component of the sludge is between approximately 50 ppm:1 percent and approximately 300 ppm:1 percent.
14. The method for dewatering biological sludge according to claim 1, wherein the biological sludge is mixed with primary sludge.
15. A composition for dewatering biological sludge that has been digested by a thermophilic digestion process according to claim 1 comprising at least one polymeric quaternary ammonium compound, as a functionally primary component, and polyacrylamide, said components being present in the composition in a ratio to enable the at least one ammonium compound to function as a primary component in forming

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microflocs for the biological sludge and the composition to function as an agent for dewatering biological sludge from a thermophilic digestion process.

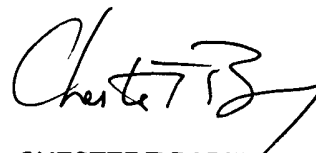
16. The method for dewatering biological sludge according to claim 1, wherein the polyacrylamide and the polymeric quaternary ammonium compound is used in solution or in dry form.

17. Cancelled.

18. Cancelled.

19. The method of claim 15 wherein the polyacrylamide is cationic or anionic.

20. The composition of claim 15 wherein the polyacrylamide is cationic or anionic.


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PRIMARY EXAMINER

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